NHS National Services Scotland

NHSScotland Electric Vehicle Infrastructure Guidance

Scottish Health Technical Note

SHTN 02-02

Version 2 - October 2024

NHSScotland Assure
Quality in the healthcare environment

Contents

1. Introduction

1.1. With urgent action needed to address the triple planetary crisis of climate change, biodiversity loss, and pollution, organisations across all sectors of society have a duty to drastically lower their greenhouse gas (GHG) and particulate emissions. In the context of transport, around 7 million people a year die from exposure to polluted air and the associated health consequences. Both the UK and Scottish Governments have committed to cutting GHG emissions, with targets set for net zero GHG emissions by 2050 at the UK level, and by 2045 in Scotland (see ref 1).

1.2. As emissions have fallen since 1990, transport has played a significant role in reducing overall GHG emissions, as well as improving air quality levels, and is responsible for 25% of the UK's total GHG emissions (see ref 2). As a result, the mobility sector is engaging in an extraordinary period of innovation, with major technological advancements being made in an effort to reduce emissions from vehicles.

1.3. In Scotland, Transport Scotland's Mission Zero for Transport Strategy (see ref 3) sets out the ambitions for public sector bodies to reduce their impact from transport. Key objectives include:

- phasing out the need for new petrol or diesel light commercial vehicles in public bodies by 2025
- phasing out need for any new petrol or diesel vehicles in public sector fleets by 2030
- phasing out need for new petrol or diesel cars or vans by 2030

1.4. As set out in the NHSScotland climate emergency and sustainability strategy: 2022-2026 (see ref 4), NHSScotland is committed to decarbonising its fleet in addition to improving active travel opportunities and infrastructure. The effective operation of NHSScotland relies on the ability to move people and health-related products quickly, safely, securely, and efficiently, often over long distances. Practical, low-carbon alternatives to petrol and diesel-fuelled vehicles will therefore need to be facilitated across all areas, particularly in more geographically challenging settings.

1.5. The Road to Zero, among other sources, has highlighted battery electric vehicles (BEVs)/ electric vehicles (EVs) as one of the most likely technologies to provide the alternative to fossil fuelled vehicles, at least in the short term.

1.6. As with petrol and diesel vehicles (termed internal combustion engine (ICE) vehicles), EVs rely on the ability to 'refuel', by charging their battery when required. Access to EV charging solutions is therefore key to facilitating the rollout of EVs for NHS fleets, staff, and other users accessing NHS sites. This Guidance will therefore consider quantity, placement, and specifications of EV charging infrastructure required on-site at NHS properties to support the transition to net zero.

Navigating this document

1.7. This guidance is grouped into a set of distinct topic areas, largely organised sequentially from ‘start’ to ‘finish’ of the process of planning, procuring, installing, maintaining, and operating EV charge points.

1.8. The Topics are as follows:

- **chapter 2** introduces the technology, outlining the range of EVs and chargers available
- **chapter 3** outlines the different types of EV user, and in particular the ways in which people will use and charge their EVs in the context of NHS facilities
- **chapter 4** discusses the key issues around assessing the demand for charging points at a facility
- **chapter 5** gives more detailed consideration towards the process of planning the charging site, from location and bay design, to engaging with Distribution Network Operators (DNOs), and securing funding to cover the costs
- **chapter 6** outlines the key points of the delivery of EV charging units
- **chapter 7** gives an overview of the issues around operating, maintaining, and managing the charging site once it has been installed
- The document concludes with sources of further useful information, including contacts and a glossary of terms.

2. Technology context

What is an electric vehicle?

2.1. The two most common types of electric vehicles (EVs) in relation to cars, vans, goods vehicles and so on, are:

- battery electric vehicles (BEVs) - these only use an electric motor and derive all power from on-board battery packs, which are (usually) charged using a power cable connected to a charging device
- plug-in hybrid electric vehicles (PHEVs) - these have both an electric motor and an internal combustion engine (ICE), giving them the ability to be recharged using a charger or refuelled using petrol or diesel

2.2. An EV does not produce any emissions in operation, since there is no combustion taking place in its running. This is beneficial from an air quality perspective (reducing the health and other impacts of poor air quality) and helps to reduce the emissions of greenhouse gases (GHGs) (particularly CO_2) when compared to ICE equivalents.

2.3. However, EVs still contribute to emissions production in their manufacture and charging, depending on the percentage of renewable energy connected to national electricity supplies (see ref 5). These 'upstream' GHG emissions related to electricity production are significantly lower for EVs than the corresponding upstream and tailpipe emissions from ICE vehicles. This is particularly significant as more of the electricity generation in Scotland (and the UK) is switching from fossil fuels to renewable energy sources (see ref 6). Also, it is worth considering EVs still produce non-exhaust particulate matter during operation from tyre and brake-wear. Though, there is no evidence available that this is more than ICE equivalents.

2.4. In the case of PHEVs, these produce emissions when the ICE is in use, and are designed to accommodate shorter trips on full electric running mode. Since PHEVs can revert to their ICEs, if necessary, their users can usually complete their journeys without needing to use EV charging infrastructure, though may still choose to do so, if it is available. However, recent evidence suggests emissions from PHEVs may be up to three-times higher than claimed when running on ICE alone (see ref 7).

2.5. For other modes of transport, e-bikes are similar to conventional bicycles but include an electric motor which provides assistance to the rider, with power drawn from an on-board battery. E-bike motors are either activated by pedalling, with the level of assistance controlled by the user (the most common form) or via a throttle alone. UK Legislation limits assistance by the motor of up to 15.5 miles per hour (mph), with power not exceeding 250 watts (W), for on-road use (see ref 8).

2.6. Models exceeding either of these performance limits, including electric mopeds and motorcycles, are required to be registered and insured as a motor vehicle, and a suitable

license/ training is required to ride them. There are also restrictions on their use on cycle paths.

Charging an electric vehicle

2.7. EVs are (generally) charged by means of a cable which connects the vehicle to a suitable charge point connector. Charge points are dedicated pieces of infrastructure that take a power supply (generally through connection to the grid, but other options are available, as described in Section 5.3), and use this to charge the battery in the vehicle. Chargers fall into the following categories:

- slow chargers provide a power output of up to 3 kilowatt (kW) alternating current (AC). The length of time to charge a vehicle will vary depending on the size of the vehicle. However, a charge can be achieved in between 6 and 12 hours for an EV, and 2-4 hours for a PHEV
- fast chargers provide between 7kW and 22kW AC power output and can generally charge an EV in 3-4 hours. The time to charge a PHEV (from 'flat' to 80%) will depend on the vehicle's maximum charging rate
- rapid chargers provide between 43kW AC and 50kW direct current (DC) charging and can generally charge an EV in around 20 to 60 minutes (typically providing around 100 miles of range per 30 minutes of charging)
- ultra-rapid/ fast chargers are becoming available, charging at between 120kW and 400kW power output. For vehicles that can accept charge at these rates, this can cut down charging time significantly. Most current PHEVs and early models of EVs cannot make use of these faster charging rates and are usually capped

2.8. To connect to chargers, a number of connection types are available. This largely depends on the car manufacturer, age of vehicle, and the rate of charge sought. These broadly fall into the following categories:

- rapid DC charging - the two most common connectors are the European Union (EU) - standard Combined Charging System (CCS), and Charge for Moving (CHAdeMO)
- rapid AC charging - this uses a standard 'Type 2' connector, as per Fast and Slow charging, however, the ability to charge at a rapid rate is limited by the make and model of the car. Please check with the vehicle manufacturer
- fast and slow charging - can typically be undertaken using a Type 2 or Type 1 or connectors using AC. Slow charging can also use a 3-pin domestic plug outlet, operating at 3kW AC, but this will be a slow, overnight charge, particularly for larger vehicles

2.9. While compatibility has previously caused issues for the early adoption of EVs, the dominance of standard connectors now means that these compatibility issues are rapidly becoming obsolete.

2.10. E-bikes use either fixed or removable on-board batteries, which can usually be charged using a standard three-pin plug via a suitable connector (either supplied or available via a dedicated charge point). Those seeking to charge an e-bike from a standard three-pin plug

socket on an NHS site, should follow guidelines relating to the use of personal electrical goods and any restrictions related to Portable Appliance Testing (PAT).

2.11. Dedicated e-bike charge points are available for indoor and outdoor use, including those which can be integrated into bicycle lockers and bicycle shelters. Systems include those suitable for fixed and/ or removable batteries, with the latter generally including a lock-box arrangement in which the battery can be placed for charging.

2.12. Electric motorbikes and mopeds can also generally be charged using a standard three-pin socket, although some models also allow charging from EV charge points using standard connectors.

2.13. More detailed installation examples and checklists will be available in the most recent edition of the Institute of Engineering and Technology (IET) Code of Practice on Electric Vehicle Charging Point Equipment Installation (see ref 9); however, qualified charge point suppliers and installers should also be able to advise on the range of charging devices available, and the compatibility of these with different makes and models of vehicle, and rates of charging.

2.14. Fleet managers should ensure that dedicated chargers being procured for the use of their fleet vehicles (FV) are compatible with those vehicles. Further information on compatibility and other requirements can be found via The Electric Vehicles (Smart Charge Points) Regulations 2021 (see ref 10).

2.15. It is worth noting that the cost of charge point units themselves can vary greatly, but generally the higher power (rapid) chargers will cost significantly more than the low power chargers.

Note 1: Tesla vehicles can utilise Tesla-specific ‘supercharger’ units, however, new models of Tesla will allow compatibility with CCS for use on the public charge point network. Furthermore, non-Tesla Supercharging has been launched to allow further access to more vehicle types. More information can be found on the Tesla website.

2.16. The UK electric vehicle supply equipment (EVSE) procurement guidance on charging points (see ref 11) details several options. For example, a 7kW charger may cost less than £1,000 for a wall-mounted unit or up to £5,000 for a ground-based unit, while a rapid charging unit may cost up to £25,000 with dual connection types or up to £30,000 with triple connection types.

2.17. The local grid-related costs and constraints are also likely to become more-significant as the combined power of the set of chargers being installed increases. Further details of these grid-related costs are provided in Section 5.3 of this Guidance.

3. Types of users and facilities

3.1. While this guidance is intended to cover the majority of NHS locations where an electric vehicle (EV) charge point installation may be required, it is not possible to cover every type of location and EV user. However, to aid readers in considering the most appropriate sections of guidance for their given requirements, typical users of EVs, and the types of facilities which may require charge point installation, are listed in Sections 3.2 and 3.3 below.

3.2. Throughout the remainder of the document, specific points of interest to particular groups of users and/ or facilities will be highlighted using the abbreviations shown in the next section.

Types of EV users

3.3. This section defines the main types of EV users that have an interest in NHSScotland facilities and considers these in relation to their potential vehicle and requirements to charge this. Those EV users considered in this document are as follows.

3.4. **Staff using fleet vehicles (FV) for operational duties** - Typically, these vehicles will be parked and managed at an NHS facility (such as a car park or service yard) while not in use. This group will cover a wide range of activities, but which largely fall into three broad categories:

- moving care providers and other staff, such as undertaking direct patient care activities, providing emergency response, out-of-hours services, and community-based nursing and so on
- moving patients, such as patient transfer services
- moving equipment, supplies and samples

3.5. Leased and pool vehicles used to carry out operational duties are also included in this category. They should have a lower charge priority to the vehicles described above but higher than the grey fleet (GF) noted below.

3.6. Agreements with and collaboration between key stakeholders, such as the emergency services, is encouraged to allow the charging of these vehicles at specified locations.

3.7. **Staff using their own vehicles to carry out their operational duties** - We refer to these users as the ‘grey fleet’ (GF). Activities will vary but will typically include patient and non-patient care roles which do not require a specialised vehicle and do not involve patient transfer, such as home and community visits by medical staff. These vehicles will typically be kept at the home of the staff member but may be parked at NHS sites while undertaking working duties. Points relating specifically to this user group are highlighted by (GF) throughout the document.

3.8. **Personal use (PU) of a vehicle by NHS staff and members of the public to access NHS facilities** - this group includes staff commuting to work, patients, carers and visitors attending appointments, visiting friends and relatives and so on. Points relating specifically to this user group are highlighted by (PU) throughout the document.

3.9. **Other users (OU), indirectly accessing NHS facilities** - This group includes a wider pool of users who may have cause to access an NHS facility, but that don't fall into one of the groups above. Typical examples of these users include:

- non-NHS delivery vehicles
- public transport vehicles picking up and dropping off passengers
- taxis and other private vehicles

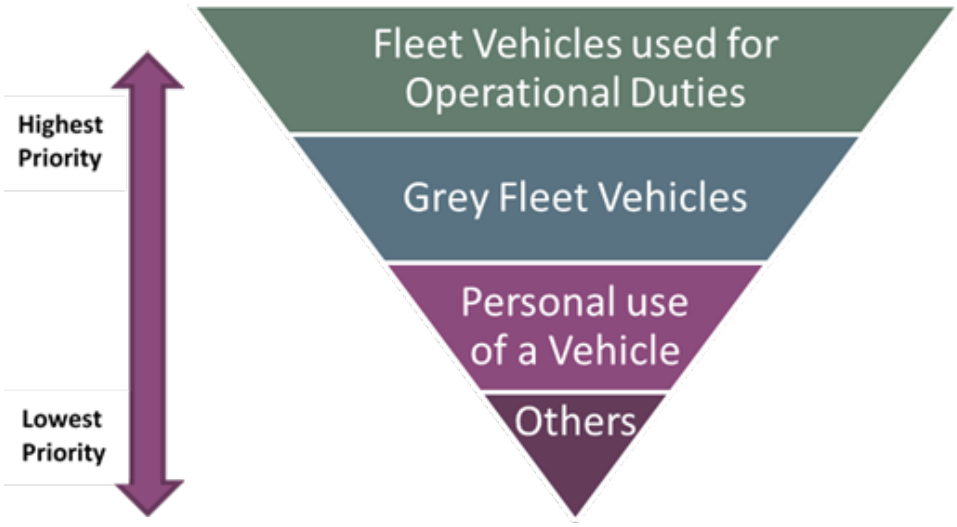
3.10. Groups related to the delivery of healthcare services, but not within the NHS may fall into this category also, such as community transport providers, the 3rd sector, and volunteers providing patient transport. Points relating to these groups are highlighted by (OU) throughout the document.

3.11. It is important to consider the different requirements for charger use across these user groups, and the relative need for charger provision at each facility in relation to these needs.

3.12. Charger needs, in terms of type, number and access are considered further in Section 4. However, at this stage, and with the need to effectively manage resources across NHS estates, it is useful to consider the priority which should be assigned to dealing with the provision and management of EV chargers for these groups.

3.13. A suggested hierarchy for priority is provided in Figure 3.1 in relation to the need for charge point provision and ensuring that vehicles have access to sufficient appropriate charge points to receive the charge they require.

Figure 3.1 - Hierarchy of charge point provision priority by vehicle user type



3.14. This hierarchy will ensure that those vehicles which are most critical to the delivery of services, and which are the direct responsibility of the NHS and any agreed key stakeholders, are catered for foremost, followed by those used in the undertaking of operational duties, but which are the personal responsibility of NHS staff.

3.15. While individual boards and facilities may see value in the provision of chargers for staff and public benefit, this is at the discretion of the board specifically and the effective supply for operational services should be prioritised. Contextual factors may influence the need for charge points for the public and commuting staff, as discussed further in Section 4.

3.16. Similarly, those needs of the 'other users' (OU) category may be considered on an ad hoc basis. This will be dependent on individual circumstances of facilities and users, for example whether providing charge points for use of taxis or community transport vehicles is appropriate, given the local context.

3.17. While there undoubtedly will be exceptions to this hierarchy within the NHS Scotland estate, this has been established to guide decision makers in the allocation of resources towards different charging solutions.

Types of NHS facilities

3.18. NHSScotland covers a wide range of facilities, such as hospitals, health centres and clinics, offices, laundries, residential accommodation, and industrial and storage units. Even within these types of facility, transport needs can vary dramatically.

3.19. However, in this section we pose several questions which are aimed to highlight some of the distinguishing features of transport needs in relation to charging. These are helpful prompts to consider before beginning the rollout of EV charge points and are applicable across many facilities.

3.20. Considering the following questions - in broad terms and in relation to each user type (as per Section 3) and specific facility - will help ensure that the most relevant information can be located later in this guidance document:

- **What types of EV will access the facility?**
- (FV) (GF) - for fleet vehicles and grey fleet vehicles, this is likely to be a relatively well-known element, available via fleet managers and fleet strategies at a local level. The charging solutions required at each site will directly relate to the types, volumes, and usage profiles of those vehicles
    - (PU) (OU) - for personal use and 'other' users, this is likely to be less well known, however, site-level facilities managers should be generally aware of the type and volume of vehicles which currently access their facilities
- **Where are vehicles parked?**
    - any locally available NHS parking guidance documents may provide useful insights

  - (FV) - for fleet vehicles, this may be in an NHS managed depot, or it may be in car park with reserved parking spaces. If these vehicles currently use uncontrolled parking, it may be worth considering whether parking them in a controlled area is possible, to ensure access to dedicated charge points
  - (GF) - for staff vehicles on operational duties, is reserved parking available or are staff expected to use uncontrolled parking spaces while on duty? Again, is it possible to provide a controlled parking area, to help ensure and manage access to dedicated charge points, if required?
  - (PU) - for personal use of vehicles by staff and the public, are there reserved parking spaces for staff and/ or is parking free or paid?

- (OU) - for 'other' vehicles, such as delivery vehicles or external transport operators, are there dedicated areas for drop-off, pick-up, and/ or delivery and could these also be used for charging?

- **How far do users have to travel to access the facility?**

  For FV, consider how far do they typically have to travel on a given shift.

  This is important for identifying how likely it is that vehicles will require a charge to complete their onward/ return journey:

  - (FV) - for fleet vehicles used for operational duties, this can relate to how far the facility is from required destinations of travel undertaken in the course of duties and how intensely a vehicle is used on any given day (such as total overall daily mileage). A comprehensive telematics system is encouraged to obtain useful journey information
  - (GF) - for grey fleet vehicles, this can include the same, but with the addition of travel distance to the staff member's place of residence
  - (PU) - for personal use of vehicles by staff and visitors, this can relate to commute distance, and how wide the catchment of patient care is. For example, a large facility with a wide catchment may necessitate members of the public to travel a distance which means they some may require a charge to get home

- **What is the typical length of time parked by vehicles?**

  This is important for determining the type of charger that is required to charge the vehicle within the given timescale, and the number of chargers to meet demand.

  - (FV) - for fleet vehicles used for operational duties, this can include extended down time (for example overnight at the end of a shift), or a short period such as a break, or where a vehicle requires to be used by a follow-on shift
  - (GF) - for grey fleet vehicles, this will relate to time on breaks or any time in an office before in in-between journeys. For initial charging by this group, this will likely also include home charging
  - (PU) - for personal use of vehicles by staff and the public, this will relate to the functions provided on-site, whether those be short appointments, longer procedures, visiting periods, or whether the vehicle is being used to commute to work by staff and so on

- (OU) - for ‘other’ users, this will be on an individual purpose basis, with some delivery vehicles taking longer to deliver large loads, taxis waiting at taxi ranks, buses stopping at layovers and so on

- **Does your facility need to cater for visiting vehicles undertaking operational duties?**

  For example, do fleet or staff members making a visit, which aren’t usually housed or charged at that site, have a need use charge points at your facility?

  - the use of shared or accessible charging infrastructure (accessible to NHS staff outwith the board area, for example) which does not impact service delivery should be considered. This is dependent on a comprehensive back-office system to potentially allow certain points to be booked in advance. Section 7 addresses this in more detail

4. Assessing the need for charge points

4.1. Having considered both the types of users accessing a site and this could impact the provision of electric vehicle (EV) charging infrastructure, an initial investigation related to electrical supply should be undertaken at this stage. This will inform consideration of the feasibility of options as the Charge Point Needs Assessment is undertaken. Section 5.3 has further information on the investigation of power options.

4.2. Two typical approaches to EV charging are described below.

1. Dedicated fleet charging facilities

- **function of charging**: ensure that all fleet vehicles (FV) receive enough charge to ensure that they can complete the journeys required by their shift and charge again at base, ready for the next shift
- **user type(s)**: (FV) and (grey fleet (GF)) vehicles used for operational duties, and occasional or planned use by grey fleet vehicles, should this be the most effective arrangement
- **vehicle type(s)**: Depending on the service provided, this could be the full range of NHS FVs as they transition to EV, as outlined in Figure 3.1 previously. This will most readily relate to cars and vans in the first instance; however, some plug-in hybrid electric vehicles (PHEV) use may be possible. E-bikes, electric motorbikes, and electric mopeds may also form part of fleets, for example cycle responder paramedic units, and e-cargo bikes. For information about fleet options, contact should be made with a local fleet/ transport manager
- **location(s) of charging**: typically, either depot based or an area of dedicated to fleet charging, or reserved spaces in a shared car park with sufficient signage and car parking management in place
- **type(s) of charge point and typical charging regime**: Where vehicle charging can be undertaken overnight or during other extended periods of downtime, the use of lower rate chargers (7 kilowatt (kW)) can prove to be most cost effective and minimise grid capacity issues. However, this will depend on the number of vehicles which need to be charged simultaneously and the length of time available to charge each vehicle
- An alternative to simultaneous vehicles using slow charging, is to use an actively managed rapid charge point (for example 50kW) when charging multiple vehicles. Manual charger switching, or automatic technical solutions (smart charging units/ management systems, as described in Section 5.3) can be used to manage fleet charging in this fashion. A spare rapid charger is also likely to be useful, in the event of vehicles requiring a charge quickly
- **number of charge points required**: Determining the number of charge points needed will require the consideration of the factors outlined above and combining these into an expected use profile. Typical steps include:
    - **fleet size**: The size and composition of the proposed fleet itself should be catalogued - a list of each vehicle which requires a charge should be

prepared, along with details on charger/ connector compatibility, the size of battery, typical charging times at compatible charging speeds

- **fleet use**: The pattern of use of the vehicles, across a period of a day, week, and so on should be mapped out. This should take account of when, where, and how long the vehicle has for both longer (for example 7 hours plus) as well shorter periods (for example at least an hour would be preferable) parked at an NHS facility in which charging could be undertaken. The typical and maximum mileages that would be done by that vehicle in between these periods should also be recorded

4.3. From this, a suitable charging regime can be planned out, based on the number of vehicles requiring a charge, how much charge they will require and how often, when and for how long they are available to charge, and the types of chargers which are anticipated to deliver this charge. This will need to consider any overlap between vehicle charging periods. This information can then be used to estimate the required number of chargers required, based on the peak charging demand plus some 'spare capacity', to cope with variations in day-to-day demand and any potential short/ medium-term growth in the relevant fleet(s)

- **risk**: A risk assessment should be undertaken in relation to mitigation procedures for coping if/ when a charger or a group of chargers suffer an issue which means that these vehicles cannot obtain their scheduled charge. The Board should consider this in their own site resilience or business continuity plans and ensure sufficient contingencies are in place
- The future requirements at the site should also be considered, to allow preparations for any further needs - see 'future-proofing sites' later in this section
- These requirements may need to be reconsidered, once further information is known on site power constraints/ options available, financial considerations, and any physical provision/ location-related constraints

If an agreement is put in place for a site to support key stakeholder FV, such as the emergency services, the requirement of these users should be considered in relation to all aspects of the above process.

2. Destination based charging

- **function of charging**: to allow a user to charge their vehicle at a destination of a journey (for example where this is an NHS facility), while undertaking the main purpose of that journey, to ensure that they have enough charge to make their return or onward journey.

  User type(s):

- (GF) grey fleet vehicles, where this is required to undertake a top-up charge on-site to facilitate the performance of duties and allowing a home or onward trip, having performed these.
    - (PU) For personal use of a vehicle by staff or the public, this relates to the need or desire to top-up for a return or onward trip

- (OU) For ‘other’ users this can include the need to top-up while undertaking a delivery. This will be highly contextual, and the responsibility to charge vehicles of this kind should not generally lie with the NHS Board/ site; however, in some rare instances there may be exceptions where it is necessary, such as a remote site
- **vehicle type(s)**: (GF), (PU), (OU) For grey fleet vehicles, a record of EVs and their requirement to charge, would be beneficial for planning purposes. For personal use vehicles and ‘other’ users, vehicles will be largely unknown, unless specifically planned for. In this instance, an assessment of the general type and volume of vehicle use would be beneficial to charging, for example via parking surveys, bicycle parking surveys. In general, vehicles will likely be car, van, e-bike or motorbike/ moped, and will use standardised connectors
- **location(s) of charging**: (GF) For grey fleet vehicles, where there is a requirement to charge - reserved spaces for this purpose would be beneficial. The remainder of users will likely be in NHS facility car parks with unreserved parking spaces, where local parking policy will apply
- **type(s) of charge point and typical charging regime**: (GF) Where possible, grey fleet vehicles should be charged by users at home or elsewhere before reporting for work, in the same way that staff are responsible for ensuring they have enough fuel to complete their shift using an internal combustion engine (ICE) vehicle. However, should charging at home or via forecourt charging (as described later in this section), be unfeasible, or a ‘top-up’ charge be required mid-shift, these users may require a charge at NHS facilities

  As with fleet charging above, this may be using either lower rate chargers (slow or fast), if only a small top-up is required, however, there may be instances where a rapid charger is required to provide a greater charge over a short time period. For e-bikes, dedicated chargers may be appropriate as part of cycle parking/ storage facilities

  (PU) (OU) - for personal use vehicles and ‘other’ users, the mix of charge point types will likely relate to contextual factors such as the catchment distance of the facility, length of stay of users, etc. and the site’s policy on requirement to provide charging to users not undertaking operational duties. E-bike battery charging lockers may be an appropriate solution for charging of removable batteries on-site, however, access to these will need to be controlled, to ensure compliance with personal and portable electrical appliance guidance
- **Number of charge points required**: determining the number of charge points within this category should first consider the requirements of grey fleet vehicles and any additional needs to those of pure fleet vehicles. Requirements can be determined in a similar way to fleet vehicles:
- (PU) - for personal use vehicles, the requirement to provide a charge is likely to be less critical, and the details of specific vehicle types and movements will be less well known. In this case, typical patterns of parking (including cycle parking) for the site should be assessed and use cases established. The ‘state of charge’, such as the actual need to charge, will vary depending on facility specific factors, however, general minimum coverage of each use case may be deemed appropriate
    - (OU) ‘other’ user charge points would be assessed on an individual case basis, but in most cases will not be required. The desirability/ need for tariffs to cover costs for these chargers should be considered, as discussed in

Section 5. of this guidance. The ability to recover these costs may determine the number of chargers that can be provided and/ or the rate of this provision

Other approaches to charging

4.4. Typical approaches to EV charging have been described below that would not necessarily be undertaken on-site at NHS facilities. However, these approaches could have an indirect effect on the need for charging at NHS sites, as they relate to the wider charging context for some NHS facility users and staff. These include:

- **'forecourt' or 'hub' charging** - typically before starting a longer-than-average journey and typically using rapid charging, to gain a charge in the minimum possible amount of time. This style of charging is most like traditional petrol or diesel vehicle refuelling at a dedicated petrol station

  It is not advisable that this type of charging should be the preferred method of charging for fleet or grey fleet vehicles. However, in some situations, such as if a vehicle must recharge while out on duties far from an NHS charging site, this could be required. If this is the case, the journey should be planned, with potential primary and backup charging locations identified, and the means to use and pay for this charging facilitated, such as the use of fuel cards which can cover EV charging. Online resources to find public EV charge points, and plan journeys are available, for example the Zap-Map and ChargePlace Scotland websites

- **en route charging** - where the vehicle requires to be charged on the way to or from an intended destination. The objective of this type of charging is generally to receive the required charge as quickly as possible, to allow the vehicle to continue to its destination. This is similar to 'hub' or forecourt charging, but generally used during a long-distance journey. This type of charging could be required, for example, where vehicles are moving between sites which are distant from each other. The same approach as preparing for hub of charging should be followed, as noted above

- **home charging** - (PU) (OU) this includes private domestic charging, such as in a garage or driveway, but can also include the use of public on-street chargers in residential areas. Typically, this type of charging is undertaken over a longer period, such as overnight, by a slow or fast charger

  This type of charging will be key for grey fleet vehicles and personal use of a vehicle by staff or the public. The ability to charge fully at home is likely to determine the 'state of charge' on arrival at an NHS facility, along with the distance travelled to that facility and the range of the vehicle in question. A range of support is available for installing home charging infrastructure from UK and Scottish Governments, and organisations such as the Energy Savings Trust (see ref 12)

Tariffs

4.5. The potential approaches to tariffing across different groups of users should be briefly considered while analysing the need for charge points. This can aid the assessment of the

scale of possible infrastructure required, in terms of the recovery of costs. Tariff options are considered in paragraph 5.56 of this guidance.

Future Proofing Sites

4.6. In assessing the needs for charge points, it is beneficial to consider not just the immediate needs of the site, but also the potential future needs. Efficiencies of scale can potentially be gained, along with practical and delivery resource driven savings, from planning for future charge point needs, and preparing for these early. The ability to plan future fleet requirements will help in this significantly.

4.7. In relation to future-proofing, one option is to provide 'passive' provision, alongside or instead of 'active' provision. These are defined as follows:

- **active provision** - the provision of active charging points, including duct work, cabling, plus the charging unit itself
- **passive provision** - the provision of associated cables, chambers, and junctions to allow for charging points to be installed at a later date without breaking ground

4.8. Putting passive provisions in place, either at the time when active charge points are being installed nearby or when other groundworks or grid supply works are being undertaken, can reduce the frequency and overall cost of these disruptive groundworks. It is therefore useful to consider the likely future requirements of a facility, to determine whether passive provision is appropriate.

4.9. Further ways to futureproof a site are to consider the likely need to install higher rate chargers in the future. For example, as battery sizes on vehicles increase, it will take longer to charge vehicles with lower rate chargers, and so it may be advantageous to have undertaken supply and cabling works which will allow upgrade to higher rate chargers at a later date.

4.10. Considering the potential for smart charging and Vehicle to Grid (V2G) solutions, as covered later in Section 5, could also help future proof sites.

Table 4.1- Summary of decision points of assessment

Types of charging	Dedicated fleet charging facilities	Destination base charging
Function of charging	Provide enough charge that all fleet vehicles can complete journeys required by their shift.	Provide enough charge for user to make return/ onward journey when their business at the site is completed.
User type(s)	• fleet vehicles used for operational duties • occasional or planned use by grey fleet vehicles, should this be the most effective arrangement	• grey fleet vehicles if a top-up charge is required • personal use vehicles • possibly 'other' users, for example a top-up when making a delivery, and more likely at remote sites.
Vehicle type(s)	• full range of NHS fleet vehicles, but initially cars and vans • assumed to be largely full EV, but possibly also PHEV during the transition of the fleet. e-bikes and electric motorbikes and mopeds	• consider record of grey fleet vehicles and requirements • consider surveys to determine likely personal and 'other' vehicles • most likely car, van, e-bike, or motorbike or moped
Locations of charging	• depot based • dedicated fleet charging area, reserved spaces in shared car park	• reserved spaces for grey fleet • unreserved spaces within facility car park for others
Types of charge point and typical charge regime	• depending on number of vehicles and time available, lower rate (for example 7kW) for overnight charging; • actively managed rapid (for example 50kW) charging useful to have a spare rapid in any case	• grey fleet to be charged before work if possible • slow or fast chargers if only small top-ups required, or rapid if likely to need bigger charge in short time • dedicated chargers at cycle parking/ storage; For personal and 'other' users, depends on likely journey distances, likely parking duration, and site's policy on responsibility to provide charging to these users.

Types of charging	Dedicated fleet charging facilities	Destination base charging
Number of Charge Points Required	Need to consider: • size and composition of proposed fleet • patterns of usage, including potential charging times and distances travelled • mitigating the effects of charger downtime • future needs.	• consider grey fleet vehicle requirements first, similar to dedicated fleet charging - size and composition of proposed fleet • patterns of usage, including potential charging times and distances travelled • mitigating the effects of charger downtime • future needs • consider survey to gauge use personal use vehicle patterns

5. Planning

Introduction

5.1. This chapter concentrates on the planning phase of charge point implementation. At this stage, a general understanding of requirements should have been gained in terms of:

- the types of users and vehicles which might be using the charge point(s)
- the operational context of the charge points, for example in a depot, at a reserved parking space, or in an uncontrolled public car park
- the potential number of chargers, type of chargers, and likely charging regimes which could be needed

5.2. At this stage the exact charge point solution should be to open to flexibility, until power source options and costs, placement options, and other planning and design factors have been explored.

5.3. To move forward with implementing a charge point solution, the following next steps will be required in the planning phase:

- identifying the locations for charge point placement, including the control of access to charge points, considering the area of placement, and charging bay design
- investigating power options, including grid connection, alternatives, and engaging with the relevant Distribution Network Operator (DNO) (Scottish and Southern Electricity Networks (SSEN), Scottish Power Energy Networks (SPEN)) and their lead times, or other available DNOs, such as independents DNOs
- considering funding sources and tariffs
- considering installers and/ or operators

5.4. Having undertaken the above, the introduction of charge points in relation to interoperability, affordability, and deliverability can be considered, before moving on to the delivery of a charge point solution.

Sustainable Design and Construction Guide (SDaC)

5.5. From the outset of the project, reference to Scottish Health Technical Note (SHTN) Sustainable Design and Construction (SDaC) Guide (SHTN 02-01) is encouraged. This allows for all aspects of sustainable design to be considered, and the project to be in-line with national ambitions wherever possible. Important considerations in SDaC when applying it to an electric vehicle (EV) charging infrastructure project include:

- project size and scale
- stage of the project
- embodied carbon and alignment to net-zero ambitions

- Lifecycle assessment (LCA)
- sustainable travel and travel planning

To help NHSScotland meet its net-zero targets, appropriate application of SDaC is vitally important. Specific guidance and information on SHTN 02-01 can be found here.

Identifying locations for charge point placement

5.6. It is necessary to consider EV parking and charging bay requirements. Factors to consider include the layout of the bays themselves, the location of the bays, fire safety (see Appendix B), and the level of restriction of the area in which they are situated. The DNO and installation contractor will be able to advise on this matter; however, it is important that these matters are considered prior to making initial contact. Engaging with DNOs is covered in paragraphs below.

5.7. The Transport Scotland (2019) Common Requirements and Good Practice for the ChargePlace Scotland Network (see ref 13) provides requirements and good practice recommendations on the location and layout of charging bays as well as other elements of charge point implementation. The key information from this document is included below, but any new editions of this document should be reviewed if the charge point is to be funded through ChargePlace Scotland (CPS) and/ or added to the CPS or any other shared network.

Note 2: CPS is a national network of EV charge points available across Scotland. It has been largely developed through grant funding to install publicly available charge points. The CPS network is operated on behalf of the Scottish Government by Swarco, correct at the time of writing. It provides a charge point management system (CPMS) to which charge point owners can connect charge points, making the posts visible to EV drivers via the CPS live status map. The CPS CPMS enables charge point owners to set the tariff for each charge point, collect payment for usage, and provides alerts in the event of a fault.

Important: At the time of writing, it is likely, though not confirmed, the CPS network will be broken up and possibly cease to exist by mid-2025. Therefore, it is vitally important for Boards to consider their own CPMS to ensure a seamless transition of charge point management and the interoperability of charging points across the NHS and wider public sector estate.

Access to charge points

5.8. The level of access to EV charge points will depend on the target group of vehicles which are to be served. In turn, this will have an influence on the level of signage or marking that is necessary on the parking bays and the level of enforcement which will be necessary on vehicles parking there:

- **fleet vehicle (FV) grey fleet (GF)** - a depot (either indoor or outdoor) may be appropriate for fleet vehicles used for operational duties or grey fleet vehicles. A dedicated EV charging depot, separate from other parking facilities, could require less formal signage than those in a public area as they would likely be less susceptible to unauthorised parking. However, the function and usage rules for the bays should be clear to those who are able to access the charging area
- **(FV) (GF)** - for fleet vehicles used for operational duties or grey fleet vehicles, arrangements could instead be made to set aside reserved spaces in a shared car park. These should be clearly signed and marked to reduce the risk of unauthorised (particularly internal combustion engine (ICE) parking, as described in the bay design section below, and as per Section 7 on physical access and enforcement
- **personal use (PU) other users (OU)** - meanwhile, personal and 'other' users should use unreserved dedicated EV spaces. These spaces are likely most at risk from being blocked by ICE vehicles. A mixture of signage/ marking and other parking enforcement measures can be considered to keep these spaces available for their intended use, as per the section on bay design and Section 7. Payment for use of charge points should also be considered at this point, as further described in this chapter.

Note 3: On public roads, Traffic Regulation Orders (TROs) will be required, to ensure that the designated EV spaces can be enforced as such. However, in private car parks TROs are not necessary - instead, consideration should be given to altering the Terms and Conditions of use displayed in the car park to enforce the dedicated EV spaces. Detailed advice on enforcement in private car parks is given in the British Parking Association code of practice.

5.9. Access to e-bike chargers should be considered on a site-specific basis as part of active travel facility planning. However, in general the provision of e-bike facilities to all levels of users should be considered as a positive step in facilitating sustainable travel patterns. Given they have batteries, fire safety, and risk must be a foremost consideration. Early engagement with local fire safety officers or equivalent is recommended.

5.10. Please consult with the local facilities manager or Local Authority planning department if you are unsure whether a TRO would be required at your facility.

5.11. Access to charging points should also consider physical access, particular for those with mobility issues or require use of a wheelchair. In that case, the relevant board equality impact assessment (EQIA) should be undertaken to ensure physical access to charging facilities is considered early in the planning process and appropriate measures are taken to ensure access for all users.

Location

5.12. Once the type of location has been established, for example at a depot or car park, the physical location of the EV charging point(s) should be considered. To an extent, the location may be dictated by practical considerations related to power supply connectivity, such as ease of access to a low voltage (LV) mains cable or a metered electricity supply.

While the DNO will provide advice on this aspect, a candidate list of locations at the NHS facility should first be drawn up, by considering a number of other selection criteria.

5.13. The first consideration will be that of physical space, with enough space required for both sufficiently sized parking bays, and the charge point including any surrounding protection needed, and as described in the section on bay design below.

5.14. (FV) (GF) - a further consideration will be that in terms of access to facilities once the vehicle is parked. Fleet and grey fleet vehicles will need to consider the same kinds of issues as with standard vehicles, for example, they can be parked where they are readily available for users once they are charged. For example, vehicles should be charged, or charged then parked, in areas in which the users have sufficient access rights to enter at all times when the vehicle may need to be used, that are not outside of walking distance from the user's base of operations (such as an off-site storage location), and where it is possible to easily load any equipment that requires to be taken in the vehicle.

5.15. (PU) - should spaces be provided for personal use, then careful consideration should be given to whether these are placed in a more 'attractive' area to park or not, such as near the entrance to the site. It should be noted that situating the EV charging area close to the facility, or in an otherwise more attractive parking location than other spaces within a public car park, increases the chance that ICE drivers may try to use the designated EV spaces, or EV users may block these spaces simply to access a convenient space. This can be addressed to a certain extent with appropriate signage and markings, as discussed under Bay Design below, and to greater effect with strict parking policy and enforcement around such actions.

5.16. In the case of disabled parking, all EV bays should be compliant with all relevant legislation; however, the provision of further dedicated disabled EV parking bays should be considered. A robust approach to this would be to provide all new disabled bays with EV charging facilities and retrofit devices in spaces where possible. Consult your local Equality and Diversity Manager, or equivalent, for specific guidance.

5.17. From a safety and security point of view, the area should be well lit and if possible, covered by CCTV. It should also be clear of areas as risk from flooding or other natural hazards.

5.18. Where installed in an outdoor location, charging equipment should meet the minimum Ingress Protection (IP) ratings.

5.19. It should be noted that the location and size of the charge point may also determine whether planning permission is required for that unit, as described in Section 6.

Bay design and unit monitoring

5.20. It is recommended that sites provide a minimum of two dedicated charging bays per charge point, with a charging unit being positioned at the centre point between each pair of bays.

This can be done regardless of whether vehicles are to be parked perpendicular or parallel to the pavement (or another designated pedestrian walkway), as shown in Figure 5.1 and Figure 5.2 respectively. In cases where vehicles can park nose-to-nose with no footway in between, charge points can be situated such that they are at the midpoint of up to four facing bays, as shown in Figure 5.3.

Figure 5.1 - Positioning of charger with bays perpendicular to pavement

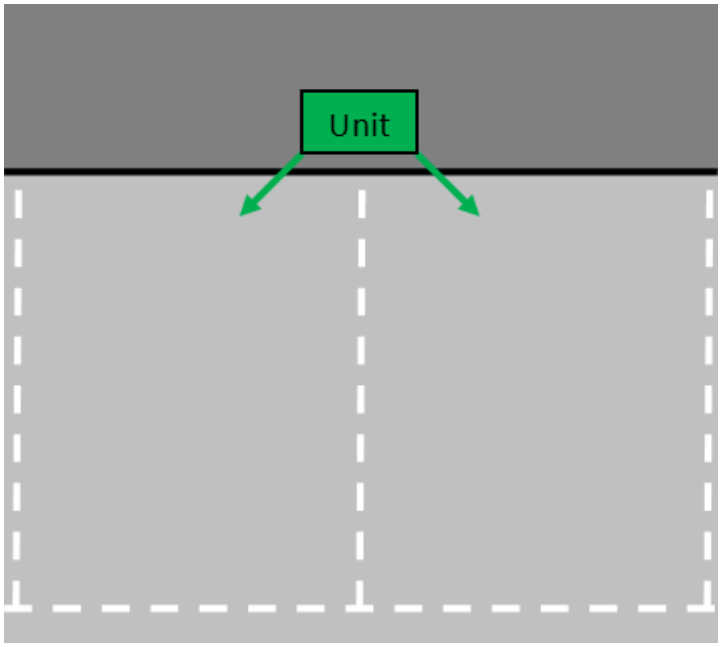


Figure 5.2 - Positioning of charger with bays parallel to pavement

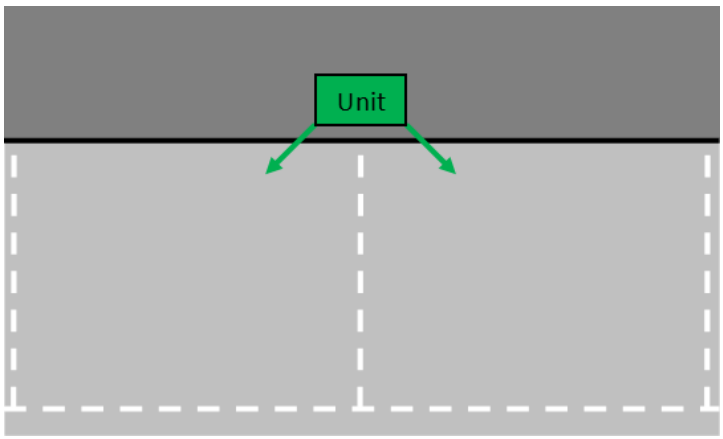
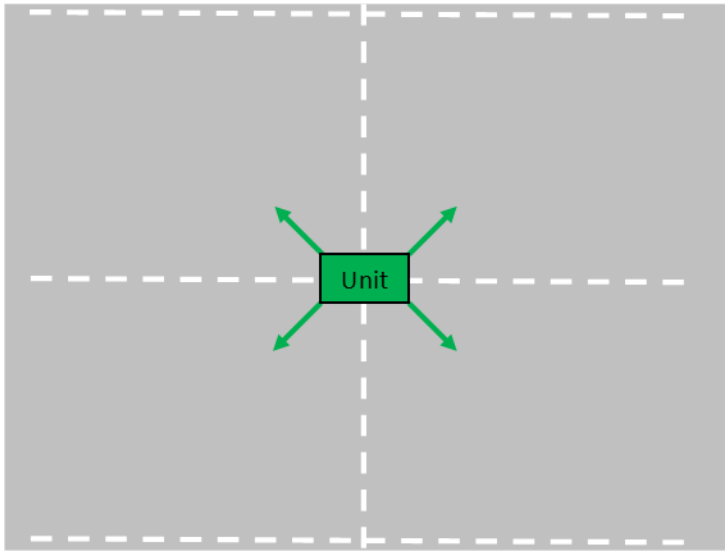


Figure 5.3 - Positioning of charger to serve four bays (no pavement)



5.21. Bays should be laid out such that they comply with national regulations for disabled access, including the provision of dropped kerbs where applicable. In addition, consideration should be given to the width of the bay from the point of view of access to a vehicle's charging socket. It is also desirable in outdoor locations, and especially in exposed areas, to provide a canopy or other covering for the charge point.

5.22. For indoor or undercover EV charging sites, wall-mounted units may be considered. This can save space and may be more practical if a power supply can be provided direct from the walls. If the bays are to be located away from walls, or in an outdoor area, then ground-based units are the alternative. In either case, charge points should be positioned such that the cables do not cross pavements or other footways or would cause a trip hazard otherwise.

5.23. If ground-mounted units are to be used, these should be protected by crash-resistant bollards.

Note 4: If traffic is expected behind the charging unit, then protective bollards should also be provided here. An example of a charging point with protective bollards at a car park in Fife can be seen in Figure 5.4.

Figure 5.4 - EV charging point with protective bollards

5.24. Wall-mounted and floor-mounted devices are currently most cost effective. However, please refer to Scottish Health Technical Memorandum (SHTM 81) - Fire Safety in the design of healthcare premises for full details or contact your local fire safety advisor. Wireless charging is not generally seen as a viable option for immediate rollout. Currently there are efficiency penalties for wireless charging compared to cabled charging, and infrastructure and compatible vehicles are currently uncommon and costly. This position may change in the future.

5.25. Signage and bay markings will be particularly important if the charging bays are located in a public area. CPS good practice guidance makes the following relevant recommendations:

"It is recommended that each bay should be marked with Traffic Signs Manual Figure 13-44 with the permitted variant 'Electric vehicle recharging point only"

"It is recommended that the bays are also marked taking account of TSRGD Diagram 1028.4 with permitted variations 'Electric vehicles', 'Electric vehicles only', or 'Electric vehs' for on road bays. Bays in car parks should also be painted green." *(see ref xiii)*

5.26. An example of bays with these markings and signage, in a public car park in South Ayrshire, can be seen in Figure 5.5.

Figure 5.5 - EV charging bays with signage and markings

5.27. In addition, it is recommended that the unit supplier provides appropriate signage to help drivers distinguish easily between the different power ratings available.

5.28. Approved charge point providers and installers should be able to provide guidance on all aspects of charge point placement, including disabled access and health and safety compliance.

Investigating power options

5.29. The feasibility of power solutions must be taken into account when considering installation of new EV charging points. EV charging represents a new source of electricity demand that neither buildings nor local LV distribution networks were designed to manage when they were first built in majority cases.

5.30. Multiple slower chargers can usually be easily accommodated on the main grid. However, large numbers of slower chargers, or smaller numbers of higher rate chargers, could have a significant impact on electricity demand at individual sites and the wider local network. The UK Government's Road to Zero strategy (see ref 14) considers that the electrification of road transport will potentially increase today's electricity consumption by about 30% by 2050, with significant impacts on the energy system.

5.31. The increased pressure on grid capacity must be managed accordingly, particularly in areas with high concentrations of EV charging. Effective planning and engagement with DNOs and other energy solutions also exist which can minimise negative impacts related to grid connection.

5.32. This section outlines the main options available for powering EV chargers, along with the process for ensuring appropriate solutions are put in place.

Factors affecting power requirements

5.33. Power requirements and capacity constraints will be determined by several factors, including:

- the existing capacity and existing load on the local connection (and therefore the amount of spare or available capacity)
- the location of the proposed chargers (particularly when a new DNO connection is needed)
- the number of vehicles charging at one time. Peak hours for different users could, for example, be during visitor parking hours for personal use, at the start of a shift or during breaks during the working day for grey fleet vehicles, or at the end of the working day for fleet vehicles
- the rates of the chargers which are to be installed, which must be balanced against the length of time a vehicle will be plugged in and the amount of charge required in this time. For example, fleet vehicles may need to be fully charged, but if they are to be parked all night, they can use a slower (significantly cheaper) charger, while if they require charging over a short time period at any time then a rapid charger may be more suitable. However, rapid charging will place a greater strain on the connection capacity over that shorter period

Available power options

5.34. The feasibility of the following power options should be discussed with the relevant facilities or energy manager before consulting the local DNO. Approved charge point providers can also undertake site assessments and work with DNOs, to consider which solution will be most suitable for the given site and charge point needs.

Grid Connection

5.35. The simplest option for powering charge points is via grid connection. Engaging with the relevant local DNO will highlight any need to provide a new connection or upgrade the existing connection to the grid. DNOs can then provide specification and costings to carry out upgrades to the power network in the area and on site, as required. Depending on the specific requirements of the upgrade, this option can turn out to be expensive and time-consuming, and therefore considering other more innovative options may be beneficial.

5.36. The cost and timescale for a new or upgraded grid connection will depend on a number of factors, including location, the number and type of chargers required, the level of upgrade required to accommodate these, and which DNO is responsible. The information in Table 5.1 gives a general illustration of costs and is compiled from guidance (see ref 15) from the two main DNOs covering Scotland - SPEN (covering central and southern Scotland) and

SSEN (covering northern Scotland). Actual prices and timescales can vary greatly depending on context and updated information should be sought from either DNO as appropriate and as early in the process as possible.

Table 5.1 - General illustration of costs

Small (up to 70 kilovolt-ampere (kVA)	Small - medium (70kVA - 300kVA)	Medium - large (200kVA +)	Large (1000kVA)
Number of charge points - 1-3 fact or 1 rapid	Number of charge points - 3-5 fast or 1-3 rapid	Number of charge points - up to 20 fast or rapid	Number of charge points - rapid charge hub with 20+ installations
Approx connection time - up to 8 weeks	Approx connection time - 8-16 weeks	Approx connection time - 3-6 months	Approx connection time - 6+ months
Approx connection costs - up to £3,000	Approx connection costs - £4,000 - £75,000	Approx connection costs - £60,000 - £100,000	Approx connection costs - £100,000+

5.37. Please note both timeframes and costs are subject to change. Contact the DNO for specific information.

5.38. Other costs which should be considered as part of the installation include:

- street work costs
- legal cost for easements or wayleaves, which may apply if the local network is shared, or if the new connection crosses land owned by a third party
- planning permission, where required
- the additional land that may be required if a new sub-station and/ or other grid infrastructure is needed (which may be the case for larger developments)

Storage based facilities

5.39. Energy storage technology can be used to take pressure away from the grid connections at peak times. On-site battery storage can be charged from the grid during low-demand periods, perhaps overnight, and then drawn from during high-usage charging periods rather than taking all the required power from the grid. This has the effect of spreading demand from the grid over the day, reducing the effective peak requirement.

5.40. Storage technology can also be used in conjunction with renewable energy sources such as solar or wind, with the power being stored during periods when supply is in excess of demand for charging/ general use. Please refer to relevant fire safety and estates technical manuals for further advice.

Renewables

5.41. Depending on available space and the solutions being considered, it may be possible to supplement or replace the power drawn from the grid with those from renewable sources. Photovoltaic solar (solar PV) panelling for example can be used on canopies above parking spaces and provide shade and shelter for the parked vehicles.

5.42. As renewable sources do not provide a consistent source of power, and since peaks of generation do not necessarily coincide with peaks in demand for charging, it is practical to combine this option with a storage system. “All-in-one" solutions, which provide a power purchase agreement (PPA), storage solutions, and managed charging points exist on the market and their use should be considered for the reasons stated above.

Smart charging and vehicle to grid

5.43. Further technology options exist which can improve the utilisation of capacity, and which could remove the need for costly connection upgrades in the short term. These are smart charging and Vehicle to Grid (V2G) and Vehicle to Everything (V2X) solutions.

5.44. Smart charging refers to the ability of the electric vehicle supply equipment (EVSE) to control the timing of charging and the power output level in response to a user-defined input or signal. These user inputs might include the level of charge required, or the duration for which the vehicle is expected to be plugged in.

5.45. The complexity of the smart charger functionality will vary, but as a basic feature they will allow scheduling of charging and local load balancing, meaning that the combined demand from multiple charge points can be controlled and limited. Potential benefits of implementing a smart charging system include:

- helping to spread demand over a longer period, therefore reducing the peak demand
- by reducing the peak demand, allowing the charging facility to work more efficiently within the constraints of the network
- optimising the costs of charging by managing the time of use
- optimising the availability of renewable electricity
- facilitating V2G charging

5.46. While smart charging is fully available commercially, V2G is still under development, with the UK EVSE Association predicting it will become a key part of the EV charging system in the next ten years (see ref 11). The principle of V2G technology is that it allows bi-directional flows between an EV and the local network. This means that energy can be stored within the EV, then exported back to the network when demand on the network is higher than the available supply. Similarly, V2X allows any other electrical assets to be charged, such as another vehicle, and can prove to be part of site resilience solutions.

5.47. While V2G technology currently has limited commercial availability, and the implications for current charging infrastructure are unclear, it may be prudent to future-proof when constructing new sites. One way of doing this could be to create appropriate passive provision at new installations to allow them to be converted into V2G charge points in the future.

Charging as a service

5.48. As mentioned previously, certain EV charging solutions exist whereby charging infrastructure is provided on a service or rental basis, rather than an owned and operated asset. This has the benefit of lessening the capital burden of such projects as well as the operation and maintenance costs of infrastructure as, typically, such models offer sourcing, installation, operation, and maintenance contained within a monthly/ yearly payment model, often for a minimum term of around 10 years.

Engaging with DNOs

5.49. In Scotland, the DNO will be either SSEN or SPEN, depending on the location. Before making initial contact with your DNO, you should have a general outline of your requirements in terms of:

- the number and types of chargers which are required
- a set of candidate locations for these to be installed
- Once an outline of the requirements has been established, this can be reviewed in an initial discussion with the DNO. Part of the initial application, the following information will be required:
    - a map of candidate locations, showing areas where the installation will likely be required and the priority of these
    - technical details of the types of charging points to be installed

5.50. The DNO will be able to provide an initial quote for the connection upgrade and can then be engaged with as the planning and delivery of the charge points are taken forward. A charge point provider can also consider layout and installation requirements of the charge points themselves and provide information on these additional cost components. When ready, a formal application for the connection of power can be made to the DNO, and once the charge points are installed, the connection made live.

Funding sources and tariff considerations

5.51. An important stage in rolling out charge points is the identification and securing of available funding sources. Typically, these can include funding for all, or a combination of the charge point infrastructure itself, along with costs related to securing installation, grid connection, and maintenance. Funding sources may be available from various sources, for example:

- direct internal NHS funding
- the Scottish Government
- regional and local authority funding, and individual initiative streams
- UK Government and UK wide funding bodies

5.52. Different funding streams are likely to come with individual conditions which must be met to secure the funding. For example, charge points funded through Transport Scotland must meet certain conditions such as the type and size of charger.

5.53. Collaborative working is one other avenue for potential funding and communication with local authority and other public sector partners is encouraged.

Tariff and charge point management system considerations

5.54. Depending on the conditions set via the funding stream used to provide the charge point, the ability to set a tariff for use on the charge point may be possible.

5.55. (FV) (GF) - for charge points dedicated for use by fleet and/ or grey fleet vehicles, it is suggested that no tariff, as such, is applied to use of the charge point. Access to these chargers should be restricted to approved users and reimbursement rates, where needed, should reflect relevant ownership and usage of the vehicle. Information on reimbursement can be found in national NHS reimbursement guidance.

5.56. (PU) (OU) - for chargers with access open for personal use by staff and the public accessing the site, and 'other' users, a suitable tariff may be desirable for cost recovery purposes.

5.57. It is recommended that e-bike charging should be tariff-free, as the costs incurred are likely to be significantly lower than for EVs, travel by bicycle is generally to be encouraged and the cost of administering a tariff system is likely to exceed the revenue generated.

5.58. At NHS sites, the level set for tariffs should facilitate the provision of the charge point and cover associated costs of providing the charge point (such as electricity and maintenance costs, and so on), however, it should not seek to generate profit from this charge. Typically, this means setting a per kilowatt per hour (kWh) rate, with either a mark-up or an additional 'per connection' charge covering additional costs. This rate should include flexibility to ensure future price changes of electricity and maintenance arrangements are taken account of. A review of the tariff should be undertaken regularly. Further information on tariffs, in relation to the future development of a national tariff structure, is provided in Appendix A.

5.59. Penalty charges for 'blocking' a charge point over certain time thresholds could also be considered to manage turnover of chargers; this is particularly appropriate for rapid chargers.

5.60. Details of costs to the user of any tariffs implemented should be clearly signposted at the charge point or app, if applicable.

5.61. CPMS, a back-office system to manage charge points which is run by the Charge Point Network Operator (CPNO), allows for a local network to offer different access rights and tariffs for different charge points and user groups such as fleets, employees and the public. Generally, this is facilitated by means of a Radio-frequency identification (RFID) access card used to start and end charging sessions. Alternatives on some networks include smart phone apps, and credit and debit cards payment (contactless or chip and PIN).

5.62. The CPMS will also allow for information to be collected about charge point usage, this information is highly important for considering management of the system and setting appropriate tariffs. Further information on the monitoring of charge point usage is provided in Section 7.

Consider suppliers, installers and operators

5.63. Consideration will need to be given at this stage to both:

- who the CPNO will be, such as the organisation who will be responsible for running the back office CPMS of the charge point(s)
- who will supply and install the charge point - this is often the same organisation as the CPNO

5.64. The above organisations will also typically provide the maintenance contract for the charge points, as discussed in Section 7.

5.65. Identifying the CPNO will allow for compatibility and interoperability of chargers to be considered, along with tariff and monitoring data options, as discussed elsewhere. The most common CPNO, and therefore CPMS, in Scotland is that of CPS, however, many others are available. Please refer to the ‘procurement options’ Section 5 for information on procurement.

5.66. Identifying the supplier and installer will allow for a site visit, scope of works, and a quotation for the charge points to be provided. To aid the procurement of the supplier and installer, a specification of requirements should be produced to outline the general needs of charge points at the site. Note should be taken of any requirements set out by the CPNO in relation to the specification.

5.67. This scope can then be further developed or refined as more detailed investigation of options are explored with both the charge point provider and the DNO, as required. As power option costs become clear, a site visit of feasible locations and installation options is undertaken.

Procurement options

5.68. NHS boards can take advantage of existing frameworks for the provision of EV charging solutions. Namely, this is included within NHS Shared Business Services Sustainable Transport and Infrastructure Framework. The framework is advantageous as it allows not only access to EV charging solutions within the market but also a wide range of sustainable and active travel services across different lots. Further information can be found via NHS Shared Business Services, quoting Framework Agreement Reference: SBS/10235.

Review of Affordability and Deliverability

5.69. The preceding stages will have established:

- the number and type(s) of charge point infrastructure
- outline cost estimates, covering legal costs, planning-related costs, land costs, the cost of the charging equipment, installation, operating costs (including the likely cost of the electricity) maintenance costs and so on
- any cost recovery options, for example tariffs
- potential funding sources/ opportunities

5.70. At this point, the gathered information on the deliverability and affordability of the preferred charge point solution should be put forward for approval, before proceeding to the delivery of the scheme.

5.71. For large schemes, an outline business case document, summarising the likely costs (such as capital expenditure (CapEx) and operational expenditure (OpEx)), benefits and risks and so on, may be required to allow the decision makers to make an informed decision. A final business case may also be required, depending on the scale of the scheme and local requirements. NHS Board level authorisation processes should be followed in respect to this.

6. Delivery

6.1. In this section, the main steps to be undertaken at the delivery stage of charge point rollout are outlined. These follow from the planning phase described in Section 5 as well as any approvals required following the review of affordability and deliverability. This stage will include the procurement/ appointment of relevant service providers to take forward the delivery of the scheme.

6.2. Please refer to the 'procurement options' Section 5 for information on procurement of authorised organisations.

Secure Funding

6.3. Having taken the decision to proceed with implementation of the charge point scheme, those funding sources which have been considered in the planning stage should be secured. Without the relevant funding in place for both capital expenditure (Capex) and operational expenditure (OpEx), the charge point delivery cannot proceed.

Further Engagement with the distribution network operators

6.4. The relevant distribution network operators (DNO) will have previously been consulted to inform the preceding Outline Business Case process. The DNO should be re-contacted at the start of the delivery phase, to ensure timely delivery of any required power works, for example a new or upgraded grid connection.

6.5. Some or all of this engagement could be undertaken and/ or managed by the charge point supplier and installer.

6.6. Once the charge points are in place and the relevant sign-offs obtained, the DNO will be required to ensure that the electricity supply is 'live' and operating satisfactorily.

Appoint a charge point supplier and installer

6.7. Having received quotations for the supply and installation of charge points during the planning phase, the preferred service provider(s) should now be appointed.

6.8. Further detailed design/ specification of the infrastructure should be undertaken, any necessary power/ grid works approved and provided in collaboration with the DNO, and all installation and works undertaken in relation to providing the charge point and supporting infrastructure, bay markings, signage, and so on. Any agreed maintenance, warranty contract and insurances and so on should be put in place at this stage.

Appoint a charge point network operator

6.9. As discussed in Section 5, potential Charge Point Network Operator(s) (CPNO(s)) should have been identified and consulted prior to the delivery stage. The procurement of the services of the preferred CPNO should be completed early in the Delivery Phase, to ensure their input can inform the detailed design.

Note 5: In Scotland, the most common CPNO is ChargePlace Scotland (CPS); however, other CPNOs are available. However, as referred to in Section 5, support for CPS is likely to be withdrawn and there exists a need to adopt a CPNO that is suitable for all NHS Boards and offers interoperability between sites, Board areas, and any other public or private sector partners.

6.10. The detailed design and specification for work from the charge point supplier and installer should ensure that all requirements for joining the preferred network are met, for example that the charge points are compatible with the CPNO's Charge Point Management System (CPMS). The charge point supplier, installer, and the CPNO should be encouraged/ required to liaise during the detailed design stage, to ensure any issues are dealt with before installation commences. The relevant hand-over of responsibility (from supplier to installer to operator) should be handled carefully, with sign-offs at each stage written into the relevant contracts.

Resolve planning permission and legal requirements

6.11. Prior to the undertaking of the installation, any legal or planning permission requirements which were identified in the planning stage should be dealt with.

6.12. Legal agreements may be required where arrangements are required between multiple organisations, to facilitate the placement of a charge point. Typical reasons include the need for an easement or wayleave, such as the right to cross someone else's land, to allow grid connection, and/ or to secure permission from a landlord or site manager, where relevant, to install the charger at the relevant location.

6.13. In relation to planning permission, consent will be required unless the permitted development requirements are met. Your local authority planning office will be able to advise what is permitted development within your area. While the most recent legislation should be reviewed, this generally relates to:

- the size of each wall outlet
- each outlet's location in relation to a road
- the height of each upstand, for ground mounted units
- a minimum number of spaces being provided for each upstand, for ground mounted units if the charger would:
    - fall within protected land, such as a site of archaeological interest, a conservation area, World Heritage Site, and so on

- does not comply with relevant name plate size, number and directional requirements

Ensure health and safety requirements are addressed

6.14. Ensuring the health and safety of all users of NHS sites is critical, including before, during and after charge point installation. Health and safety specifics related to the charge points and installation themselves are considered in Section 7.

7. Operation and management post installation

Access management and enforcement

7.1. Once the charging units are installed and operational, it is important to ensure that they are available to be used for their intended purpose. This means managing and enforcing access, so that the chargers are not blocked by electric vehicles (EVs) of a different user category or by vehicles using the bay but not the charger.

7.2. Some of the issues discussed here are also considered under Access to Charge Points and Location in the discussion of charge point placement in Section 5, above.

7.3. The actions best taken to protect the bays for the intended use will depend on the location and intended users of the devices. For example, a depot for fleet vehicles used for operational duties or grey fleet vehicles will be protected by physical access restrictions and will therefore require little additional enforcement of the spaces other than internal fleet management processes.

7.4. For vehicles using reserved spaces in a shared car park, a combination of measures can be used. This can include signs and markings intended to prevent either internal combustion engine (ICE), or unauthorised EV use. Private car Terms of Use can include a fine for improper use of these bays, and for public locations the appropriateness of Traffic Regulation Orders (TROs) can be considered with local authorities.

7.5. If space management is still anticipated to be an issue, a Smart Parking system could be considered, which would see the parking bay monitored, and the facility notified if a vehicle is parked in the bay but was not charging.

7.6. Access to the chargers themselves can be restricted through the Charge Point Management System (CPMS), allowing charging only from those authorised to charge on specific chargers, for example by way of Radio-frequency identification (RFID) access card.

7.7. For dedicated but unreserved bays in a car park, signage and marking strategies should be used, along with Terms of Use of the space. As above, car park Terms of Use, or the need for a TRO, can be considered to allow the ability to issue a fixed charge penalty notice if a bay is blocked by an ICE vehicle, a non-charging EV, or a vehicle which has overstayed any relevant time restrictions indicated on the relevant signage (and in the TRO). As with the reserved bays, a Smart Parking system will help identify vehicles parked in the bays without charging.

7.8. Use of the bays can also be partly managed through application of tariff policies, such as an additional cost for charging for more than an hour. This would encourage shorter stays, freeing up the space for other EV users.

Maintenance contracts

7.9. It is important to ensure a maintenance contract and Service Level Agreement (SLA) are in place which will help guarantee a good level of service for the charge point users. Quotes and specifications of these should be obtained from the installer and/ or the Charge Point Network Operators (CPNO), (often the same organisation) during the proceeding procurement processes.

7.10. Typically, a charge point will come with a 12-36-month warranty, which will cover the majority of any maintenance issues within that period. A contract to cover maintenance and servicing thereafter can be agreed when installation is being commissioned or towards the end of the initial period. Transport Scotland's guidance, however, on good practice for the ChargePlace Scotland network is as follows:

"It is recommended that each charge point is covered by a 5-year warranty and annual servicing package. This should include the requirement to repair out of service charge points within 48 hours, including a site visit when required."

Note 6: As an electrical appliance, the charge point should be tested annually, to meet current health and safety guidelines.

7.11. Any further requirements of the maintenance contract can be specified when the contract is agreed, and depending on the specific details of the site, the criticality of the chargers being available and the level of spare capacity and so on, it may be desirable to go beyond the 'minimum' level of service suggested above. Site access arrangements should also be agreed for authorised contractors.

7.12. For example, a response time of 48 hours may be acceptable for a charge point intended for vehicles for personal use by staff users; however, if the charge points are intended for fleet vehicles for operational duties, it would be advisable to request a faster, more urgent response time to defective units. Any 'enhanced' cover, will subsequently increase the cost of the maintenance contract. This trade-off should therefore be considered as part of the detailed design and any business case preparation required, as per Board level authorisation processes. This may require review by a business continuity/ resilience manager.

7.13. Other features which could be specified in a maintenance contract or SLA include:

- remote monitoring and fault detection, and remote repair if possible
- different specified levels of response time depending on the severity of the issue with the charge point
- a helpline service for users (or site staff), providing a first point of contact for issues which it may be possible to resolve remotely

Note 7: It is also important to be clear on what the maintenance contract does not cover. For example, repairs to damage through misuse or vandalism are unlikely to be included. For this reason, it is imperative that insurance is taken out which can cover such items as user damage, as well as liability costs in the event of an accident.

7.14. Further consideration of vandalism and security is provided below.

7.15. It is also important to consider decommissioning of charge points at the procurement stage, as part of the maintenance process. Decommissioning costs can sometimes be reduced through design, by installing a unit which is easier to upgrade or replace. A decommissioning agreement need not necessarily be put in place at the time of installation; however, consideration should be given at this stage to how the decommissioning will take place and who has responsibility for it.

Vandalism and security

7.16. Vandalism and other damage to the charging units can be disruptive to the operation of the charging facility, as well as being costly to repair. In 2018 for example, chargers in Moray were vandalised with confectionary, causing an estimated £800 of damage and taking months to repair.

7.17. As outlined earlier in this chapter, warranty agreements are unlikely to cover repairs following vandalism, so separate insurance cover may be required to cover this, and the following preventative measures should be considered.

7.18. The level of additional measures required will depend on the situation of the specific charging area. In the case of a depot arrangement, where vehicles (most likely fleet vehicles used for operational duties) are parking in a restricted area, little additional security will likely be needed over and above that of the depot itself, although these should be reviewed for appropriateness.

7.19. Where the chargers are located in a public area, the following should be considered:

- ensure that the chargers are located in a well-lit area siting the chargers in well-used areas or somewhere clearly overlooked from buildings, in order to promote natural surveillance, if possible, have CCTV cover of the charging area

7.20. In addition, some charging units are more robust or vandal-resistant than others. The robustness of the charging units should therefore be discussed and agreed with the unit supplier and installer during the procurement stages.

Monitoring

7.21. There are two main aspects to the monitoring of the EV charging units to consider - the monitoring and recording of the units themselves, and the monitoring of their usage.

Monitoring of charging units

7.22. It is important that the installation of the EV charging units is co-ordinated, and that the details of each unit installed are recorded within an Asset Management Framework. Details to be recorded could include:

- location of the unit
- type of unit
- cost of unit/ cost of installation
- age of the unit/ installation date

Monitoring usage

7.23. A great deal of important and useful information is available through the CPNO's CPMS. ChargePlace Scotland recommend that this is recorded through a Measuring Instruments Directive (MID); SI 2006/1153) (see ref 16) approved electricity meter.

7.24. Further details of the minimum information which should be recorded via the CPMS will be available through procurement guidance in due course, as per Section 5., however, it is recommended that the following information is recorded at a minimum for each charging session:

- a unique ID for the charging session
- the ID of the charge point used
- the ID of the user
- the date and time the vehicle was plugged in
- the date and time that charging commenced, which may be different from the plug-in time
- the date and time that the vehicle was unplugged
- the date and time that charging ended, which may be different from the unplug time
- the total amount of charge (in kilowatt per hour (kWh)) delivered

7.25. The recording of this information will give insight into the usage patterns of the chargers, allowing comparison with the anticipated usage and aiding in future decisions about the provision of charging facilities (and any tariffs).

7.26. When choosing an appropriate CPMS and charge point, care should be taken to ensure use of an Open Charge Point Protocol (OCPP), to ensure that management systems for different chargers can communicate with each other. This is crucial when considering use of NHS charge points by other boards and public sector partners.

In addition, the information recorded can be used to generate financial information about the chargers and the users. For example, the cost of the electricity being drawn from the chargers can be calculated, as can the income received from user payments. In the case of

grey fleet vehicles, it may be decided to implement a reimbursement system where they employee initially pays for the charge, in which case this information can help automate the repayment process. The information can also be used to review decisions about the tariff structure.

7.27. Outside of any CPMS, dedicated electricity metering for charging units is considered best practice. In doing so, dedicated metering provides an additional layer of insight into charging point use, which carries the secondary benefit of clearer billing with the installer's energy provider. The latter may be useful on sites where the NHS is a tenant but has installed charging points.

Health and safety

The Facilities project manager (or equivalent) overseeing the installation is responsible for operating a compliant facility in accordance with all appropriate guidance and standards, such as:

- Construction (Design and Management) Regulations 2015 (see ref 17)
- Scottish Health Technical Memorandum (SHTM) 00 Best practice guidance for healthcare engineering (see ref 18)
- SHTM 06-01 Electrical services supply and distribution part A: Design considerations (see ref 19)
- SHTM 06-02 Electrical safety guidance for low voltage systems (see ref 20)

After installation, site operations, departments and the designated Health and Safety Lead will also have responsibilities under general law (including consumer protection legislation) to ensure the safety of patients, staff and users:

- Consumer Protection Act 1987, SI 1987 c 43
- Health and Safety at Work etc. Act 1974, SI 1974 c 37
- Management of Health and Safety at Work Regulations 1999, Statutory Instruments (SI) 1999 No.3242

However, additional NHS specific and/ or site-specific requirements may also need to be considered, including for example providing relevant access permissions to installers.

Decommissioning and disposal

7.28. At end of useful life for EV charge point infrastructure, which varies between manufacturers, organisations may need to decommission and dispose of these assets. Here, it is important to refer to any previously conducted lifecycle assessment (LCA) as part of SDaC, to ensure the organisation has accounted for this in any relevant reporting. Additionally, the organisation must refer to relevant guidance or legislation surrounding waste disposal, such as Waste Electrical and Electronic Equipment (WEEE) and guidance relating to

decommissioning of electrical installations. Please refer to SHTM 00 Best practice guidance for healthcare engineering (see ref 21).

Training and guidance

7.29. Consideration should be given to the provision of both training and further guidance documents related to EV charge points and their use.

7.30. Training will fall into three distinct categories, as follows:

- training provided to staff or contractors who are actively involved in the use of EV charge points in the undertaking of operational duties. This will generally be provided by approved contractors, and the inclusion of such in service agreements can be specified at the procurement stage. Those being trained will likely include those directly responsible for charging single or multiple fleet vehicles, as well as those responsible for charging their own personal vehicle using an NHS charge point. Any training should ideally be undertaken on the vehicle, charge point type, and if possible, the location, with which the user will be undertaking their duties
- training provided for staff who may have role in maintenance or installation of charge point infrastructure, potentially as part of their duties as an on-site engineer. Best practice training standards, as outlined in SHTM 06-02: Electrical safety guidance for low voltage systems, Appendix 7: Qualifications and training requirements, should be enforced for all staff (internal and external) who are expected to work on charge point infrastructure, including but not limited to, those contracted for supply, installation, and maintenance. The appropriateness of allowing any engineering works to be undertaken by NHS staff or contractors should be considered carefully, and any restrictions to warranties and so on (such as regarding who can undertake charge point engineering works) should be considered
- training to staff on the rollout, management and monitoring of charge point use - it may be beneficial to provide further training to individuals who are responsible for the rollout, management and monitoring of charge point sites to support them in completing this role
- further guidance documents could also be provided on a national, health board, or site level for numerous purposes, both internally to staff, to contractors, and the public. For example, physical or online documents on using chargers could be provided

8. Contacts

8.1. Questions relating to this guidance document can be directed to the NHSScotland Assure Climate Change, Sustainability and Environment team at nss.sustainabilityscotland@nhs.scot

8.2. Any other questions relating to NHS Board-specific queries should be directed to the appropriate local manager.

Appendix A Setting EV charge point tariffs

A.1 In the original development of this guidance document in 2019, the Short Life Working Group (SLWG) suggested that it would be appropriate for a set of electric vehicle (EV) charge point tariffs to be established which can be applied across all NHSScotland facilities. However, the creation and management of national charge point tariff would require the development of a process/ tool by which to set an appropriate initial rate and then regularly monitor and adjust this value at agreed points in time, for example, annually.

A.2 Given the complications and complexity of administering an NHSScotland-wide tariff, no further work has progressed, and it remains at the discretion of the health board to implement a tariff that is suitable for their organisation.

A.3 Individual NHS Board contractual agreements with energy providers, as well as regional variances in pricing, mean that a national tariff is not viable at the time of writing.

A.4 Any tariff that is implemented at a local level will need to ensure that NHS EV charge points receive enough revenue from the use of charge points to cover the costs of the charge point network's development, operation, maintenance, and so on. However, it should not seek to produce revenue beyond the covering of these costs, such as profit. To set a tariff which adequately balances costs and revenues across the network, a strong understanding of the costs related to charge point assets and their usage will be required at a national level. This will require common practice and co-ordination between NHS Boards in the monitoring and reporting of these costs.

A.5 This section describes the most common costs involved in EV charge point provision and demonstrates the importance of establishing an appropriate tariff in relation to demand for charger use.

The Costs incurred by the charge point owner

A.6 Broadly, the costs related to EV charge point provision fall into three categories:

direct variable costs - these costs are directly related to the volume and frequency of charging undertaken on the charge point network. The main component of this is the amount of electricity which is supplied to vehicles from the charging points. As the demand for EV charging may vary over the course of a day, week, or month, therefore the cost of this is variable. The amount of charge delivered is recorded by each charge point and reporting on this can be provided to the NHS from the Charge Point Network Operator (CPNO). This allows usage to be monitored over time, and a typical charging pattern and cost of any given charger, or group of chargers, to be determined. While estimations of usage going forward cannot be perfect, they are still vital for determining an appropriate 'break even' tariff

direct fixed costs - as well as the variable costs described above, a number of fixed costs will be incurred which relate directly to the charge point itself. These include elements such as the daily standing charge from the electricity supplier, as well as the purchase, installation, insurance, and maintenance service costs of the charger. As described in the main body of this guidance document, there are also a number of costs related to providing electrical power supply to the charger

administration costs - these are additional costs which result from the back-office administration of the charge point. These typically relate to the management of the charge point by the CPNO, as well as the collection of payment from the charge point user and the distribution of this to the charge point owner (such as the NHS). This includes such costs as bank fees for card transactions and VAT. These costs are generally applied as either a percentage of the revenue payment, or a fixed charge per transaction (such as per charge point use)

A.7 The above costs may vary between individual charge points due, for example, to differences in the type and age of the charge point, or any distinction in management and maintenance contracts which are in place (for example through different suppliers). The mechanism by which the charge point was funded will likely also affect the actual costs incurred by the NHS for that charge point, for example national grants typically cover installation, power supply connection, and maintenance for a set period.

The tariff incurred by the charge point user

A.8 The above section relates to costs incurred by the charge point owner. Here we consider costs from the user perspective, such as the tariff they are charged for using the charge point. An EV charge point tariff can consist of a combination of the following components:

- a connection fee - a flat-fee incurred each time the user connects to the charge point, regardless of how much electrical charge is drawn (for example, a £1.50 connection cost)
- a fee for the charge drawn - a fee which is proportionate to the volume of electrical charge delivered by the charger when charging the battery of the vehicle, for example £0.45 per kilowatt per hour (kWh) used
- a penalty charge - usually related to the breaking of the ‘usage policy’ of the charger/ parking bay, for example a £10 charge for overstaying a 60-minute time limit on the charger

A.9 The SLWG for this guidance established that the ‘fee for charge drawn’ at a per kWh rate would be the preferential tariff model at NHS chargers. It also considered that there may be instances where penalty charges are appropriate, for example to manage turnover and avoid misuse at busy chargers.

A.10 The SLWG has not recommended that a ‘connection fee’ be included as part of any national NHS charge point at this stage.

A.11 However, as connection fees remain a valid mechanism by which to recover costs incurred for charge point provision, the inclusion of such a tariff component could be reviewed in the future should a need for this become evident.

Balancing costs incurred with tariff revenue

A.12 Put simply, to allow the NHS EV charge point network to 'break even', the costs incurred by the NHS (the charge point owner) need to be offset by the revenue generated from charge point users charging their car. It has been noted above that some of the costs incurred are fixed and will be incurred even if the charge points are not used, while other costs relate to the amount of electricity used and administration of the charge point.

A.13 The total revenue generated is a function of the tariff and the amount of vehicle charging that occurs. Therefore, if less charging than originally expected when setting the tariff occurs, then the revenue generated will be much lower than predicted. For example:

- 1,500 charges at £4.00 for a charge would produce £6,000 revenue
- 1,500 charges at an electricity cost of £2.00 would cost the NHS £3,000 to supply
- 1,500 charges would leave £3,000 to cover fixed costs and administration costs, including VAT
- 1,000 charges would generate £4,000 revenue, cost £2,000 in electricity supply, and only leave £2,000 to cover fixed costs (installation costs, maintenance fees, and so on) and administration costs, including VAT

Please note, these are intended as examples only and are electricity prices are subject to change.

A.14 Therefore, to ensure all costs are covered, it is important to:

- review historic charger usage levels (with as large and robust a data pool as possible) and forecast this forward based on a set of reasonable assumptions
- estimate the costs components related to existing assets, and forecast how these will change across the period of the tariff, including those that will vary based on charger usage and the scale and type of EV infrastructure rollout
- review the above forecasts and the applied tariff regularly, for example every 12 months, to consider excesses and shortfalls in revenue

A.15 Accurate knowledge of charge point assets and charger usage is key to the above. Please refer to Section 7 of the guidance, related to monitoring, for further information on this.

Appendix B Fire safety - charging electric vehicles

C.1 Fire safety is a critical factor in the determination of the location and suitability of charging points for electric vehicles (EV), where all safety factors should be taken into account by reference to existing Scottish Health Technical Memorandum (SHTM). This guidance note is in addition existing guidance and concentrates on issues that have arisen. It seeks to clarify fire safety issues around the siting of charging points, external to healthcare and other NHSScotland premises, and should be used to assist NHS Boards in that respect.

C.2 There are no specific NHSScotland regulations or guidance that advise charging equipment or vehicles should be a specific distance away from a building or whether charging can take place under a canopy and these elements should be considered as part of a fire risk assessment.

C.3 However, based on computer modelling analyses carried out by Glasgow Caledonian University[1] on behalf of NHSScotland Assure, it is recommended that, subject to all other risk factors being considered, vehicles that are being electrically charged should be sited at least three metres from a building to prevent heat from a vehicle fire impacting upon the structure or smoke entering windows or other openings. Once all factors have been taken into account, the fire risk assessor may recommend a distance of less than or in excess of three metres depending on the circumstances.

C.4 A fire risk assessment will be specific to the area being considered and should be carried out by a competent assessor, usually a qualified NHSScotland Board fire safety advisor.

C.5 The following are examples of the factors that should be considered by an assessor:

- the number of vehicles being charged and their proximity to each other with regard to fire spread from one vehicle to another
- have all electrical safeguards and regulations been adhered to
- the likelihood and effect of fire spread to the building structure
- the construction of any canopy to determine if it will contribute to fire spread if ignited
- the type of external wall cladding
- whether there are any windows or openings in the building that would allow the ingress of smoke or heat
- the means of identifying a fire in the charging location and giving warning to building occupants if required

[1] The computer modelling carried out by Glasgow Caledonian University was in relation to various safety considerations for a specific building that included proximity of vehicles to external wall cladding that was not deemed to be fully non-combustible.

- procedures to alert the fire service if a fire occurs

C.6 The following documents will assist in the fire risk assessment process as well as the wider considerations that NHSScotland Boards should take into account;

- SHTM 85: Fire precautions in existing healthcare premises
- SHTM 86: NHSScotland Firecode Fire Risk Assessment
- Covered Car Parks: Fire Safety Guidance for Electric Vehicles, UK Government
- RC59 - Risk Control - Fire Safety When Charging Electric Vehicles, Fire Protection Authority
- Common Requirements and Good Practice for the ChargePlace Scotland Network, Transport Scotland
- Electric Vehicle Charging in Residential and Non-Residential Buildings, UK Government
- Traffic Signals Manual - Chapter 3, Section 13.16 Electric Vehicle recharging point, UK Government

Abbreviations

AC: Alternating Current

BEV: Battery Electric Vehicle

Capex: Capital Expenditure

CCS: Combined Charging Systems

CHAdeMO: Charge for Moving

CPNO: Charge Point Network Operator

CPMS: Charge Point Management Systems

CPS: Charge Place Scotland

DC: Direct Current

DNO: Distribution Network Operator

EQIA: Equality Impact Assessment

EU: European Union

EV: Electric Vehicle

EVSE: Electric Vehicle Supply Equipment

FV: Fleet Vehicle

GF: Grey Fleet

GHG: Greenhouse Gas

ICE: Internal Combustion Engine

IET: Institute of Engineering and Technology

IP: Ingress Protection

KvA: kilovolt-ampere

kW: kilowatt

kWh: kilowatt per hour

LCA: Lifecycle Assessment

LV: Low Voltage

MID: Measuring Instruments Directive

Mph: miles per hour

NSS: National Services Scotland

OCPP: Open Charge Point Protocol

OpEx: Operational Expenditure

OU: Other Users

PAT: Portable Appliance Testing

PHEV: Plug-in Hybrid Electric Vehicles

PPA: Power Purchase Agreement

PU: Personal Use

PV: Photovoltaic

RFID: Radio Frequency Identification

SHTM: Scottish Health Technical Memorandum

SHTN: Scottish Health Technical Note

SI: Statutory Instruments

SLA: Service Level Agreement

SLWG: Short Life Working Group

SPEN: Scottish Power Energy Network

SSE: Scottish and Southern Electricity

SSEN: Scottish and Southern Electricity Network

TRO: Traffic Regulation Order

V2G: Vehicle to Grid

V2X: Vehicle to Everything

W: Watt

WEEE: Waste Electrical and Electronic Equipment

Glossary

AC - Alternating current.

Amp or ampere (A) - A measure of electrical current.

Battery EV or BEV - An EV (electric vehicle) solely propelled by an electric motor, deriving all power from on-board battery packs, which are (usually) charged using a power cable connected to a charging device. Wireless charging options do exist but at not yet commonplace.

Capacity - Capacity is the amount of energy that can be safely drawn from a circuit without damaging it or items that are attached to it.

CHAdEMO - CHAdEMO is a rapid DC EV charging protocol with a connector called the Japan Electric Vehicle Standard (JEVS) G105.

Charge point or charger - The unit which an EV is plugged into to charge their battery. This typically comes in wall mounted or ground mounted (upstand) formats. It includes one or more sockets or tethered plugs, the user interface, access control, energy metering and circuit protection.

Combined charging system or CCS (combo 2) - CCS is and EV charging protocol brought in as an EU standard. The CCS Combo 2 provides a connector for DC rapid charging.

ChargePlace Scotland (CPS) - The largest network of EV charging points across Scotland, funded by the Scottish Government through grants and operated on their behalf by Swarco.

Charge Point Management System or CPMS - A system run by the Charge Point Network Operator (CPNO; see entry below) which is used to securely record all relevant data on charge points, users and charge events. A secure mobile phone network signal is used to send information and instructions between the CPMS and the charge points, using the Open Charge Point Protocol (OCPP). This communication is needed when a registered user wishes to use a charge point, with the CPMS confirming their access rights. Some upgrades to charge points can also be carried out remotely using the CPMS, as well as using the system to monitor the charge points to ensure they are in working order.

Charge point network operator or CPNO - An organisation which operates and maintains charge points and associated CPMS (see entry above) on behalf of the host sites. There are numerous CPNOs operating in Scotland, with the largest currently being Charge Place Scotland (CPS; see entry above).

DC - Direct Current.

Department for Transport or DfT - A department of the UK Government, responsible for policy, guidance and funding relating to road, rail, sea and air transportation. A number of

powers relating to transport in Scotland, such as Electric Vehicle development and other road transport matters, are devolved to the Scottish Parliament and therefore come under the remit of transport Scotland.

Electric Vehicle or EV - An electric vehicle powered by an electric motor, either fully (a Battery EV or BEV) or as an option alongside an internal combustion engine (ICE) (a Plug-in Hybrid EV or PHEV).

Energy - Energy here is used to refer to electricity.

Fast Charging - Fast chargers provide between 7kW and 22kW AC power output and can generally charge a BEV in 3-4 hours. The time to charge a PHEV (from 'flat' to 80%) will depend on the vehicle's maximum charging rate.

ICE - Internal Combustion Engine.

Installation - Installation here is used to refer to all the steps required at a parking bay to prepare it for use for EV charging. This includes the fitment and activation of the charge point unit itself, along with necessary markings, signage, barriers, or additional electrical infrastructure.

kW - The kilowatt (kW), equal to 1000 Watts (1000W), is a unit of electrical power. It indicates a rate of energy consumption.

kWh - The kilowatt-hour (kWh) is a unit of energy, typically used to express an amount of electricity consumed or stored. In terms of a EV battery, it indicates the power level which can be provided by the battery for one hour, or the number of hours for which 1kW of power can be supplied.

kVA - The kilovolt-ampere (kVA) is a unit of apparent electrical power, expressed as the voltage times the current. It is used for alternating current (AC) electricity, to distinguish from 'real' power in Watts or kilowatts, when expressing the power capacity of a wire or switch.

Local Authority or LA - Council-run organisation funded by the Scottish Government, with responsibility to maintain and run public services and assets in their local area. Scotland is divided into 32 such Local Authority areas.

Low Emission Zone - A low emission zone is a defined area which requires vehicles entering that zone to be of a minimum emission standard, in order to improve air quality and discourage unnecessary journeys.

Permitted development rights - Permitted development rights are derived from The Town and Country Planning (General Permitted Development) (Scotland) Amendment Order 2014. In general, permitted development rights allow for certain developments to be undertaken without the need to apply for planning permission from the Local Authority, provided the development meets certain conditions. In respect of EV charging,

developments of this kind can be made without planning permission provided they meet the requirements of Scottish Statutory Instrument 2014 No, 142, Part 2D1.

Plug-in - The primary way to recharge most EV batteries is to connect the vehicle to the grid by means of a power cable which can be 'plugged in' to a charging unit or home adapter.

Plug-in Hybrid EV or PHEV - A vehicle which can be powered either from electric motor or via an ICE. Generally, the electric battery capacity will be smaller than a pure Battery EV, with the ICE perhaps being used for longer-distance trips and the battery being reserved for shorter-distance urban driving. The battery can be charged by plugging into the grid, or from the ICE.

Rapid charging - Rapid chargers provide between 43kW AC and 50kW DC charging and can generally charge a BEV in around 20 to 60 minutes (typically providing around 100 miles of range per 30 minutes of charging).

Slow or Standard charging - Slow chargers provide a power output of up to 3kW AC. The length of time to charge a vehicle will vary depending on the size of the vehicle, however, a charge can generally be achieved in between 6 and 12 hours for a BEV, and 2-4 hours for a PHEV.

State of Charge - The amount of energy currently in the EV battery. This can be expressed as the number of kWh of charge, the estimated distance what can be driven on the remaining charge, or as a percentage of the maximum battery capacity.

Traffic Regulation Order (TRO) and Traffic Management Order (TMO) - Traffic Regulation Orders (TROs) are how Local Authorities control the behaviour of traffic in their area, particularly with regard to vehicle movement and to parking. They are required when a change to parking restrictions, for example to create dedicated EV charging, is to be made on a public road. They cannot however use d for enforcement in private car parks.

A Traffic Management Order (TMO) is an equivalent mechanism to a TRO which is used within London.

Transport Scotland - The transport agency for the Scottish Government. Transport Scotland has a number of responsibilities, including public transport policies, major transport projects, and operating and maintaining the Scottish trunk road network. As part of developing strategy for decarbonising Scotland's transport network, they are responsible for promoting the uptake of EVs and other Ultra Low Emission Vehicles.

Type 2 - Type 2 is a kind of connector used for AC EV charging at various speeds. It is a seven-pin connector used in the UK and the EU and is defined under International Standard EN62196-2.

UK EVSE - The UK Electric Vehicle Supply Equipment Association is a trade association comprised of Charge point suppliers, Charge point test equipment suppliers and Charge point Network Operators (CPNOs).

ULEV (Ultra low emission vehicle) - ULEVs are a category of vehicle with little or no tailpipe emissions. The most common kinds of ULEV are electricity powered, although this group includes other alternative fuel vehicle such as those running from hydrogen cells.

Ultra Low Emission Zone - Separate from the LEZ, the only ULEZ in the UK at the time of writing is found in London and requires more stringent emissions standards for vehicles. More information can be found on the Transport for London (TfL) website.

Vehicle to Grid (V2G) Charging - A technology currently under development but anticipated to be significant within the EV charging system in the near future. It will allow two-way flows between EVs and the local network, meaning energy can be stored in an EV battery and drawn on during times of high demand on the network.

Vehicle to Everything (V2X) - Similar to V2G, a technology currently under development but anticipated to be significant within the EV charging system in the near future. It will allow two-way flows between EVs and local assets, meaning energy can be stored in an EV battery and drawn on during times of high demand on the network.

Volt - The unit of electrical ‘potential difference’ between the live and neutral in a circuit. When the voltage is increased through a circuit or connector, the current will increase in proportion, while the power will be increased as the square of the increase in voltage.

Zap-Map - Zap-map.com is an online resource showing the location of EV charging points across the UK and Ireland along with user-driven feedback on the status of the charge points. The site also provides route-planning assistance as well as more general advice and information about EVs.

References

1 Climate change (2020) (Accessed: January 10, 2024).

2 Transport and environment statistics 2022 (2023).

3 Transport Scotland (2021) Mission Zero for transport | Transport Scotland. (Accessed: January 10, 2024).

4 The Scottish Government (2022) NHS Scotland climate emergency and sustainability strategy: 2022-2026.

5 Réquia, W.J. et al. (2017) 'Carbon dioxide emissions of plug-in hybrid electric vehicles: A life-cycle analysis in eight Canadian cities,' Renewable & Sustainable Energy Reviews, 78, pp. 1390–1396.

6 The Scottish Government (2023) Energy Statistics for Scotland - Q4 2022.

7 Transport & Environment, (2023) Plug-in hybrids 2.0: A dangerous distraction, not a climate solution. Accessed Jan 2024

8 Electric bikes: licensing, tax and insurance (2015).

9 The IET Code of Practice for Electric Vehicle Charging Equipment Installation, 4th Edition (2019).

10 King's Printer of Acts of Parliament (2020) The Electric Vehicles (Smart Charge Points) Regulations 2021.

11 UK EVSE (2017) Making the Right Connections: General procurement guidance for electric vehicle charge points, Updated-UK-EVSE-Procurement-Guide.pdf (r-e-a.net). (Accessed: January 10, 2024).

12 Energy Saving Trust (2023) All you need to know about electric vehicles - Energy Saving Trust.

13 Transport Scotland (2019) Common Requirements and Good Practice for the ChargePlace Scotland Network

14 Office for Low Emissions Vehicles (OLEV) (2018) Reducing emissions from road transport: Road to Zero Strategy.

15 Scottish Power Energy Networks (SPEN) (2019) Application forms and guides.

16 Office for Product Safety and Standards (2014) MID approved gas and electricity meters.

17 Health and Safety Executive (2015) Construction - Construction Design and Management Regulations 2015 (Accessed: January 10, 2024).

18 NHS National Services Scotland, Health Facilities Scotland (2013) Healthcare engineering - Policies and principles of best practice guidance (SHTM 00) | National Services Scotland (Accessed: January 10, 2024).

19 NHS National Services Scotland, Health Facilities Scotland (2015) Electrical services supply and distribution (SHTM 06-01) | National Services Scotland (Accessed: January 10, 2024).

20 NHS National Services Scotland, Health Facilities Scotland (2015) Electrical safety guidance for low voltage systems | National Services Scotland (Accessed: January 10, 2024).

21 NHS National Services Scotland, Health Facilities Scotland (2013) Healthcare engineering - Policies and principles of best practice guidance (SHTM 00) | National Services Scotland (Accessed: January 10, 2024).